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The USENIX Association Newsletter

Volume 14, Number 5

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The closing date for submissions for the next issue of *;login:* is October 27, 1989

NOTICE

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The USENIX Association is a not-for-profit organization of those interested in UNIX and UNIX-like systems. It is dedicated to fostering and communicating the development of research and technological information and ideas pertaining to advanced computing systems, to the monitoring and encouragement of continuing innovation in advanced computing environments, and to the provision of a forum where technical issues are aired and critical thought exercised so that its members can remain current and vital.

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Contributions Solicited

Members of the UNIX community are encouraged to contribute articles to *:login:*. Contributions may be sent electronically to login@usenix.org or through the U.S. mail to the Association office. The USENIX Association reserves the right to edit submitted material.

:login: is produced on UNIX systems using *troff* and a variation of the -me macros. Contributions should be in *n/troff* input format, using any macro package.

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Workshop on Experiences with Distributed and Multiprocessor Systems[†]

October 5-6, 1989, Marriott Hotel, Ft. Lauderdale, FL

The goal of this workshop is to bring together individuals who have built, are building, or will soon build distributed and multiprocessor systems, especially operating systems. The workshop will feature full presentations and work-in-progress presentations on aspects of building and using these systems. The workshop will provide a forum for individuals to exchange information on their experiences, both good and bad, in designing, building, and testing their systems. This includes experiences with coding aids, languages, distributed debugging tools, prototyping, reuse of existing software, performance analysis, and lessons learned from use of such systems.

Tentative Schedule

Thursday, Oct. 5

8:30 **Opening remarks.** George Leach, Workshop Chair

8:45 **Session I: Objects and Virtual Memory**

A Distributed Implementation of the Shared Data-Object Model by Henri E. Bal,
M. Frans Kaashoek and Andrew S. Tanenbaum (Vrije Universiteit, Amsterdam)

An Implementation of Distributed Shared Memory by Umakishore Ramachandran and
M. Yousef A. Khalidi (Georgia Institute of Technology, Atlanta)

An Object-Oriented Implementation of Distributed Virtual Memory by Gary M. Johnston and
R. H. Campbell (University of Illinois at Urbana-Champaign)

10:45 **Session II: Process Control**

Experience with Process Migration in Sprite by Fred Dougis (University of California, Berkeley)

Dynamic Server Squads in Yackos by Debra Hensgen and Raphael Finkel (University of Kentucky, Lexington)

Fine-Grain Scheduling by Henry Massalin and Calton Pu (Columbia University, New York)

1:30 **Session III: Performance Considerations**

The Parallelization of Mach/4.3BSD: Design Philosophy and Performance Analysis
by Joseph Boykin and Alan Langerman (Encore Computer Corp., Marlborough)

Efficient Implementation of Modularity in RAID by Charles Koelbel, Fady Lamaa, and
Bharat Bhargava (Purdue University, West Lafayette)

Making libc Suitable for use by Parallel Programs by Julie Kucera (Convex Computer Corp., Richardson)

3:30 **Session IV: Concepts**

Revolution 89 -or- Distributing UNIX Brings it Back to its Original Virtues by Francois
Armand, Michel Gien, Frederic Herrmann, and Marc Rozier (Chorus Systems, En Yvelines)

[†] Sponsored by the USENIX Association and the Software Engineering Research Center (SERC), in cooperation with ACM SIGOPS and ACM SIGSOFT, and with the IEEE-CS TC on OS and IEEE-CS TC on Distributed Systems.

A Network File System Supporting Stashing by Luis L. Cova, Rafael Alonso, and Daniel Barbara (Princeton University)

- 4:20 Work-in-Progress presentations.

Friday, Oct. 6

- 8:30 Session V: Multiprocessors

TUMULT-64: a real-time multi-processor system by Pierre G. Jansen and Gerard J. M. Smit (University of Twente, Enschede)

Experiences with a Family of Multiprocessor Real-Time Operating Systems
by Prabha Gopinath and Thomas Bihari (Philips Laboratories, Briarcliff Manor)

Implementation Issues for the Psyche Multiprocessor Operating System by Michael L. Scott, Thomas J. LeBlanc, and Brian D. Marsh (University of Rochester)

- 10:30 Session VI: Tools

Experience with P/Mothra: A Tool for Mutation Based Testing on A Hypercube by ByoungJu Choi and Aditya P. Mathur (Purdue University, West Lafayette)

Debugging and Performance Monitoring in HPC/VORX by Howard P. Katseff (AT&T Bell Laboratories, Holmdel)

CAPS - A Coding Aid used with the PASM Parallel Processing System by James E. Lumpp, Jr., Samuel A. Fineberg, Wayne G. Nation, Thomas L. Casavant, Edward C. Bronson, Howard J. Siegel, Perre H. Pero, Thomas Schwederski, and Dan C. Marinescu (Purdue University, West Lafayette)

The Implementation of Aide: A Support Environment for Distributed Object-Oriented Systems
by Rodger Lea and Johnathan Walpole (University of Lancaster, Bailrigg)

- 1:30 Session VII: Object-oriented Construction

Experience With Implementing and Using An Object-Oriented, Distributed System
by D. Decouchant, M. Riveill, C. Horn, and E. Finn (Bull-IMAG, Gieres)

Prototyping a distributed object-oriented OS on UNIX by Marc Shapiro (INRIA, Le Chesnay)

The Clouds Experience: Building an Object-Based Distributed Operating System
by C. J. Wilkenloh, U. Ramachandran, S. Menon, R. J. LeBlanc, M. Y. A Khaldi, P. W. Hutto, P. Dasgupta, R. C. Chen, J. M. Bernabeu, W. F. Appelbe, and M. Ahamad (Georgia Institute of Technology, Atlanta)

- 3:30 Session VIII: Communications, Heterogeneous Systems, and the A-word

Experiences with Efficient Interprocess Communication in Dune by Marc F. Pucci and James Alberi (Bell Communications Research, Morristown)

Using Transputer Networks to Accelerate Communication Protocols by Horst Schaaser (Hewlett-Packard Laboratories, Bristol)

ARCADE: A Platform for Heterogeneous Distributed Operating Systems by David L. Cohn, William P. Delaney, and Karen M. Tracey (University of Notre Dame)

A Decentralized Real-Time Operating System Supporting Distributed Execution of Ada Tasks
by Roger K. Shultz (Rockwell International-Collins Divisions, Cedar Rapids)

The registration fee is \$225. For information contact the USENIX Conference Office at (714) 588-8649 or judy@usenix.org.

Professional Development Seminars

October 30, 1989, Chicago, IL

The Association is initiating a series of Professional Development Seminars in major metropolitan areas of the United States that are not currently scheduled for USENIX conferences. The seminar program is a subset of the tutorials offered at the Conferences.

The first seminar will be held in Chicago on October 30, 1989, at the Westin Hotel. Descriptions of the three tutorials to be offered follow.

Mach Overview

Avadis Tevanian, Jr., NeXT Inc.

This tutorial is intended for people who would like to find out about Mach and its internals. People interested in doing a port of Mach should find it especially useful.

This tutorial will study the Mach Operating System and Environment in detail. Emphasis will be on the Mach kernel internals, including design and implementation philosophies, virtual memory management, thread scheduling, and inter-task communication. Both machine-dependent and independent parts of the kernel will be examined, including the machine dependent interfaces that must be implemented to port Mach to a new machine. UNIX compatibility, as implemented within the Mach kernel, will also be examined.

In addition to the Mach internals, the basic mechanisms available to users will be studied, including an introduction to the basic user level services such as the Network Message Server, the Mach Interface Generator, and general Mach programming hints. The tutorial will also include discussions of the latest Mach features, future plans, and distribution.

Introduction to Programming The X Window System,[†] Version 11

Oliver Jones, Apollo Computer, Inc.

This tutorial is for experienced C programmers who are familiar with graphics workstation technology and networks but unfamiliar with Version 11 of the X Window System. People preparing to design and develop application software to run under X will find this tutorial especially useful.

The tutorial will address Xlib, the C language interface to X. By covering low level X requests, the tutorial will lay the conceptional foundation for understanding and applying the various high-level human interface toolkits and user interface management systems available as layers on X. The tutorial will provide a basis for understanding the X toolkit.

An Introduction to C++

Robert Murray, AT&T Bell Laboratories

This tutorial is for technical persons with a fairly complete knowledge of C. Knowledge of objected-oriented programming or data abstraction is not required.

A survey of the main features of C++ will be presented, along with some short examples of how to use the features effectively. Most use of C++ falls into one of three flavors: a better C, data abstraction, and object-oriented programming. The tutorial will examine these flavors, starting with the features and paradigms that are closest to C and progressing to the more ambitious (and potentially more powerful) features. The relationship between C++ and the draft proposed ANSI C standard will also be discussed.

For further information or a registration form contact the USENIX Tutorial Office at (303) 499-2600, FAX (303) 499-2608, or johnd@usenix.org.

[†] The X Window System is a trademark of M.I.T.

5th USENIX Computer Graphics Workshop

November 16-17, 1989, Doubletree Hotel, Monterey, CA

The theme of the workshop is "personal graphics." By this, we mean the use of computer graphics to aid, benefit, or amuse a single person. Generally, personal graphics applications are highly interactive, so that the user has a great deal of control over the result. Furthermore, the graphics is frequently not an end product, but is instead a communication medium between the user and computer.

The presentations in this workshop span a wide range of applications and platforms, and range from the immediately practical to the visionary. Several of the presentations will include video tapes of interactive systems, and we hope to also have some live demos. Plenty of time will be included in the schedule for interaction between attendees and speakers.

The Workshop Chair is Spencer W. Thomas, University of Michigan.

Tentative Schedule

Thursday, November 16

Opening Session

Microfabrication on the Macintosh by Carlo H. Séquin

3D Animation on the Macintosh with 3DWorks by John F. Schlag and Julian E. Gomez

The Acorn Outline Font Manager by Neil Raine, David Seal, William Stoye and Roger Wilson

Programming Systems

NewS Classes by Owen Densmore

Visual Programming with Arachne by John Danskin and Sally N. Rosenthal

The Panel Library by David A. Tristam

Friday, November 17

Lessons learned

Learning from a Visualized Garbage Collector by Mark Weiser, Barry Hayes and Jock Mackinlay

Design Considerations for Multitasking, Windowing, Networked, Multi-platform, Distributed Applications by Ron Reisman

The Render Button by Jon H. Pittman

Views of Other Worlds

Part-Task Flight Simulation on a UNIX Graphics Workstation by Steven H. Philipson and Stefan Jeffers

The Shape of PSIBER Space: PostScript Interactive Bug Eradication Routines by Don Hopkins

Virtual Reality by Jaron Lanier

For information on registration, contact the USENIX Conference Office.

Call for Papers: USENIX C++ Conference

USENIX is pleased to host its second full C++ conference in San Francisco, California, April 9-11, 1990. We intend this conference to be of interest to a broad range of C++ users and potential users. Even if you have never written a C++ program, you will probably be able to learn enough from the tutorials to follow the technical sessions. This announcement provides early information about the dates of the events as well as persons to contact for further information. The pre-registration packet containing detailed Conference information and hotel reservation information will be mailed in January, 1990.

The meeting headquarters will be the San Francisco Marriott Hotel.

Schedule of Events

Tutorials, April 9

The tutorial program is ideal for people who have been thinking about using C++ but haven't had the opportunity to learn it, as well as experienced users of and researchers in the language.

Please contact the program chair if you are interested in giving a tutorial or have a topic you would particularly like to see covered.

Technical Sessions, April 10-11

The technical sessions will cover the spectrum of work on and with C++, spanning the diversity of its users and applications, and showcasing current research and development. The technical sessions will focus on the current strengths and weaknesses of the language, show where it is and where it is going, and act as a forum for discussion of its future.

Papers are solicited on all aspects of C++, including:

Applications
Libraries
Programming environments
Case studies
New or improved implementations

Extended abstracts (no more than 2 pages) or papers (9-12 pages) must be received, either electronically (preferred) or on paper, by **Friday, January 12, 1990**. Authors will be notified of acceptance by February 5 and must submit a full paper electronically and in camera-ready form by April 9.

Queries about the technical program and all electronic submissions (*n/troff*, *TEX*, or PostScript preferred) or camera ready copies should be directed to:

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Peter Canning	Urbana-Champaign Hewlett Packard

Long-Term Calendar of UNIX Events[†]

1989 Oct 5-6	* Distributed Systems Workshop	Marriott Marina, Ft. Lauderdale, FL
1989 Oct 16-20	IEEE 1003	Brussels, Belgium
1989 Nov 1-3	UNIX Expo	Javits Conv. Ctr., New York, NY
1989 Nov 9	NLUUG	The Netherlands
1989 Nov 9-10	14th JUS UNIX Symposium	Osaka, Japan
1989 Nov 15	POSIX APP Workshop	NIST; Gaithersburg, MD
1989 Nov 16-17	* Graphics Workshop V	DoubleTree Hotel, Monterey, CA
1989 Nov 24	AFUU	Paris, France
1989 Dec 5-6	JUS UNIX Fair 89	Tokyo, Japan
1989 Dec 8-9	UNIX Asia '89	Sinix; Singapore
1989 Dec 11-13	UKUUG	Cardiff, Wales, UK
1989 Dec 11-15	OSI Implementors Workshop	NIST; Gaithersburg, MD
1990 Jan	UNIX in Government	Ottawa, Ont.
1990 Jan 22-26	USENIX	Omni Shoreham, Washington, DC
1990 Jan 23-26	UniForum	Washington Hilton, Washington, DC
1990 Jan 29	IEEE 1003	New Orleans, LA
1990 Mar 5-6	X3J11	New York, NY
1990 Mar 26-30	AFUU	Paris, France
1990 Apr	IEEE 1003	Montreal, Que.
1990 Apr 9	POSIX APP Workshop	NIST; Gaithersburg, MD
1990 Apr 9-11	USENIX C++ Conference	San Francisco, CA
1990 Apr 23-27	EUUG	Munich, Germany
1990 May	UNIX 8x/etc	/usr/group/cdn; Toronto, Ont.
1990 Jun 11-15	USENIX	Marriott Hotel, Anaheim, CA
1990 Jun 11-13	UKUUG	London, UK
1990 Sep 11-14	AUUG	Southern Cross, Melbourne, Australia
1990 Oct 22-26	EUUG	Nice, France
1990 Nov 15	POSIX APP Workshop	NIST; Gaithersburg, MD
1991 Jan 21-25	USENIX	Grand Kempinski, Dallas, TX
1991 Jan 22-25	UniForum	Infomart, Dallas, TX
1991 Feb	UNIX in Government	Ottawa, Ont.
1991 May	UNIX 8x/etc	/usr/group/cdn; Toronto, Ont.
1991 May 20-24	EUUG	Tromso, Norway
1991 Jun 10-14	USENIX	Opryland, Nashville, TN
1991 Sep 16-20	EUUG	Budapest, Hungary
1992 Jan 20-24	USENIX	Hilton Square, San Francisco, CA
1992 Jan 21-24	UniForum	Moscone Center, San Francisco, CA
1992 Spring	EUUG	Jersey, UK
1992 Jun 8-12	USENIX	Marriott, San Antonio, TX
1992 Autumn	EUUG	Amsterdam, Netherlands
1993 Jan	USENIX	Town & Country, San Diego, CA
1993 Mar 2-4	UniForum	Washington, DC
1993 Jun 21-25	USENIX	Cincinnati, OH

[†] Partly plagiarized from John S. Quarterman of TIC and Alain Williams of EUUG by EY.

* USENIX Workshops

Book Review: Programming in C++

by Stephen C. Dewhurst and Kathy Stark

(Englewood Cliffs, NJ: Prentice-Hall, 1989, ISBN 0-13-723156-3)

Reviewed by George W. Leach

uunet!pdn!reggie

If you have been looking for a book for the purpose of learning C++ that also explains the concepts behind data abstraction and object-oriented programming, then this book is for you. It is one of several new books coming out of Bell Labs concurrently with the release of version 2.0 of the C++ Translator. The authors have been involved in the development of a C++ compiler at Bell Labs for several years and have been privy to many of the design decisions made by Bjarne Stroustrup. They bring a unique perspective on C++ and insight on the philosophy behind many of the features of the language and how to effectively utilize them.

The book is organized in a progressive manner, which gradually introduces new concepts without overburdening the reader with inappropriate details. The examples are carefully chosen to reflect a progression of design that one might experience when using a language such as C++ for the first time. The book parallels Stroustrup's presentation of Object-Oriented Programming and expands upon those themes.¹ It is assumed that the reader has a background in procedural programming. It is not a requirement that the reader be well versed in C, but it wouldn't hurt.

Chapter 0, "Introduction," provides some background on C++, a brief discussion of programming paradigms, and an overview of the organization of the remainder of the book.

Chapter 1, "Data Types and Operations," will seem familiar to most C programmers, especially those who are well informed concerning ANSI C. This chapter immediately immerses the reader in the vernacular of the C++ world. For example, the concept of overloading of operators is introduced by examining arithmetic operations on the built-in types,

`int` and `float`. While the overloading is a compiler and not a programmer directed activity in this context, it is a familiar concept with which the new concept may be explained. This provides the reader with a familiar point of reference for understanding a new concept that will later appear as a feature of the language. This pattern of introducing new concepts using familiar ones is repeated throughout the book.

The features new to those familiar with C introduced in this chapter include the function call style cast, user defined types (classes) by way of the ubiquitous complex number data type example, new and delete operators, and references.

Chapter 2, "Procedural Programming," begins with a cursory overview of functional decomposition and structured programming, which provides a familiar basis for discussing other programming paradigms in future chapters. A `String` `typedef` is utilized as an example to illustrate this style of programming. A simple program to input, sort, and output an array of `Strings` is presented. This example is also used to present the reader with those features of C++ that are applicable to writing programs in a procedural style. These are the features that normally are presented to support the view of C++ as a better C.² They include overloading, inline functions, and type checking, conversion and default initialization of function arguments and return types.

Chapter 3, "Classes," covers the language features of C++ that support the class concept. A class is the mechanism for realizing data abstraction,³ which is further expanded upon in the next chapter. The topics covered are class types (public and private), data members, function members, operator functions, access protection of class members (public, private,

protected), friend functions, initialization and conversions, and pointers to class members. A String class and a binary tree Node class are developed as examples in this chapter. These classes will be utilized in later chapters.

Chapter 4, "Data Abstraction," introduces data abstraction by examining the complex number class from Chapter 1 and the String class from Chapter 3. The key concept that is stressed is the separation of behavior, or the public interface to the abstract data type, from the implementation, which is encapsulated within the private part of the class definition. Sorted collections of integers and Strings are discussed next. This leads into the topic of generic or parameterized types. C++ does not yet support this concept.⁴ The authors present a limited form of this capability utilizing the existing language features. Control abstraction is introduced using the example of an iterator for a linked list. This is an important discussion. Although many have heard of ADTs, few people realize that different forms of abstraction exist.⁵ The application of control abstractions can make an ADT all that more powerful, both in isolation and in usage with other data types.

Chapter 5, "Inheritance," discusses inheritance as a means of realizing a new abstract data type from one that is almost what we want, but not quite. The specific topics of this chapter are base and derived classes, class hierarchies, virtual functions, protected members, inheritance as a design tool, inheritance for interface sharing, multiple inheritance, and virtual base classes. The linked list type from the previous chapter and the Node type introduced earlier are utilized throughout this chapter along with some more concrete examples from the problem domains of compiler and operating systems design.

Much as the discussion of classes in chapter 3 set the stage for presenting data abstraction in chapter 4, this discussion leads into the next chapter on object-oriented programming by providing a C++ context within which it may be explored.

Chapter 6, "Object-Oriented Programming," discusses the object-oriented design

paradigm as an extension of data abstraction. A couple of brief examples are provided to illustrate this approach. The clean mapping of objects in a C++ program to real world objects is presented in the form of an operating system kernel's view of the world as processes and devices. It was just at this point in the book where my mind started to think about past experiences with simulation and GPSS⁶ and how nice it would be to provide the same capabilities in C++. Then I turned the page to a discussion of the C++ task library and a complete airport simulation!

Chapter 7, "Storage Management," discusses the creation, destruction, and accessing of instances of objects. Constructors, destructors, and the new and delete operators are examined in greater detail than in previous encounters. Allocation and deallocation of arrays of class objects are discussed by presenting the standard C++ library functions `_vec_new` and `_vec_delete`. This is followed by a discussion of providing class-specific implementations of the new and delete operators. A powerful mechanism known as "smart" pointers is presented as a mechanism for checking as well as accessing objects that are available through indirection. And finally, some techniques for efficiently using storage when creating new objects is presented by way of realizing the copy semantics for objects of a class by applying the `X(X&)` ("X of X ref") argument to a constructor.

Chapter 8, "Libraries," presents new ways to think about libraries. First, the concept of creating an envelope around existing C libraries for access via C++ syntax is presented. Next the reader is treated to a discussion of how application specific libraries can be built to obtain the effect of a special purpose language with C++ (GPSS?). The chapter and the book are wrapped up with discussions of extensible and customizable libraries. These two sections provide the reader with an interesting side effect, the distinction between the two. Often both are thought of as being one and the same thing. However, they are not. The example provided of an extensible library is the C++ standard `streamio` library and its capability to deal with

user-defined types. Libraries can be customized by the application of inheritance to arrive at the desired behavior.

The appendix provides the answers to selected exercises from each chapter of the book.

I found this book to be enjoyable and stimulating reading. Too often the discussions would lead me to think of ways of applying the features of the language to past problems that a procedural paradigm just could not deal with properly. I would find similar problem solutions in the examples following the discussions. Was this coincidence? I don't think so. The authors have done a fine job in crafting this book.

This book has emerged just as C++ is gaining popularity. As such it is filling an important niche at just the right time. The content is current with Release 2.0 of the C++ Translator from AT&T. The authors state in the Preface that they avoided details that could confuse users of different versions of C++. They further alert readers to the fact that certain new features such as multiple inheritance and refinement of the language may differ from the implementation that may be accessible to the reader. However, what is missing is an appendix of differences between versions 1.2 and 2.0 of the C++ Translator as is found in Lippman's book.⁷

I would like to acknowledge the assistance of Andrew Koenig of AT&T Bell Laboratories and Hillary Leach, my wife, in reviewing this review. Special thanks to Andrew Koenig for providing me with the C++ macro.

References

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- [4] Stroustrup, Bjarne, "Parameterized Types in C++," *Journal of Object-Oriented Programming*, January/February, 1989, pp. 5-16.
- [5] Liskov, B., and Guttag, J., *Abstraction and Specification in Program Development*, MIT Press and McGraw-Hill, 1986.
- [6] Bobillier, P. A., Kahan, B. C., and Probst, A. R., *Simulation with GPSS and GPSS V*, Prentice-Hall, 1976.
- [7] Lippman, Stanley B., *C++ Primer*, Addison-Wesley, 1989.

Summary of the Board of Directors' Meeting

Baltimore, MD, June 11-12, 1989

Attendance

Rob Kolstad, Marshall Kirk McKusick, Sharon Murrel, Michael D. O'Dell, Alan G. Nemeth, John S. Quarterman, Deborah K. Scherrer; Ellie Young, John L. Donnelly, Neil P. Groundwater, Judith F. DesHarnais; Duncan McEwan, Dan Klein, Mike O'Brien, Dan Appelman, Donnalyn Frey, Mark Seiden, Dominic Dunlop.

Online Index/Library Update

Scherrer reported that all USENIX and related publications have been indexed and are available on UUNET, and that EUUG may be able to donate papers they have online. She would like to have *UNIX Review* indexed.

Standards

Quarterman reported that the contract with EUUG, USENIX, and Dominic Dunlop has been signed, and Dominic has completed his first "Snitch" report on the ISO JTC1 SC15 WG22 (POSIX) meeting in Ottawa in May. Quarterman has hired Jeff Haemer to edit the USENIX Standards Watchdog committee reports.

Budget

Young went over the cash flow model for the first six months. She explained that we were on target in most categories and pointed out that: income from proceedings sales was over what was budgeted for the entire year; the Software Management workshop netted \$4,800; and Transaction Processing netted \$4,000. While attendance at the Baltimore conference will be less than projected, the higher attendance at San Diego would balance out the shortfall somewhat and give us approximately \$30,000 in additional discretionary funds for the fiscal year. McKusick felt that lower attendance at Baltimore may be due to the program. O'Dell felt that location might be a factor as well.

Current meeting

Groundwater gave a report on the speakers. Donnelly reported that the Baltimore convention center had a good floor plan, there are 66 exhibitors, 26 tutorials, and 2,000 would mostly likely attend the conference.

Executive Office Report

Young went through her report. Out of the 622 people who became members at the San Francisco conference in 1988, 31% had renewed as of May, 1989. It was decided to open up 4.3BSD manual sales to anyone who wishes to purchase them.

Transaction Processing Workshop

Murrel reported that there were good technical papers, and 102 people attended.

Future Meetings

Washington, D.C. '90. DesHarnais reported that there are not enough meeting rooms at the Shoreham, and hence only eight tutorials can be scheduled per day. She expects 1600-1800 attendees.

1993 Winter & Summer Conferences. DesHarnais has contracts for winter in San Diego and summer in Cincinnati.

Future Workshops

Systems Administration III. Kolstad reported that he and Evi Nemeth will be giving two concurrent tutorials the day before the workshop.

Distributed Systems. Kolstad reported that we had attained co-sponsorship with ACM, IEEE, and SERC.

C++ 1990. It was agreed that we could not limit the number of attendees given the attendance in the past, and Young was asked to see if Waldo would be interested in a larger format. [He was; see page 7 -EY]

New Workshop Topics

Nemeth reported that the SIGMA project in Japan is reaching its conclusion. It is a major effort within the Japan computer industry focusing on software environments in UNIX. He suggested that USENIX offer a workshop for SIGMA people to inform us on what they have done. There was discussion regarding logistics. Nemeth and Kolstad offered to do a proposal.

Scherrer suggested a workshop on Mach, and will prepare a proposal.

Young had contacted Matt Bishop, and he was interested in doing another Security workshop in 1990.

Quartermann suggested a UNIX and documentation workshop. Nemeth said it may be time for a hypertext version of the UNIX manuals. Quartermann felt this task should be discussed in a workshop and suggested using a questionnaire at the conferences to ascertain who these folks are - 1) users of documentation or 2) producers of documentation - and how do we deal with variations? O'Dell thought there was a problem of heterogeneity. Nemeth said it might be an interesting workshop and needs some reshaping. Kolstad felt it can't win. Quartermann and O'Dell will look for a person to submit a proposal.

Journal Report

O'Dell described the contents of Volume 2:2 which is an all Bell Labs issue. He stated that the papers were starting to come in better and that over 50% of the submissions were rejected. Young went over the UC Press promotion and circulation report. Nemeth congratulated O'Dell on his efforts.

Abstracts vs. Extended Papers Committee Report

Murrell reported on behalf of the committee that they had agreed that both types of papers are important to our conferences, and that we need to decide which type for each conference. There was a lengthy discussion about past history, logistics, quality of papers, and assumptions relating to which type of paper makes a better conference.

Murrell offered the following summary: 1) that the program chair has the choice on types of papers, and 2) the Board needs to provide predictable guidelines. It was agreed that we not permit any two successive conferences to require full papers and to notify future conference chairs.

Nominating Committee Suggestion

Kolstad expressed his concerns that reports from the nominating committee can be construed by the membership as endorsements rather than slot-filling. All the Board present, except Kolstad, agreed that the nominating committee should be an endorser, and that the formal charge to the committee is to find enough eligible people (decent candidates) to fill the slots.

EUUG and a World UNIX Users Group

Scherrer had several notes from Teus Hagen regarding the formation of a world UNIX users group, and there was a discussion regarding our joining such an organization. Quartermann stated that a world group would be good for standards and networking activities. It was agreed that if we want to do more joint activities with EUUG, it would not require a world group. Scherrer suggested we have better networking between organizations.

Sales of Books at Conferences

Quartermann expressed concern that Jim Joyce was using the Association's name in publicity for his hospitality suite at the Hyatt in Baltimore. Young was instructed to send a letter informing him that we are aware of his activities and misuse of the Association's name on the net.

Washington, D.C., Program Report

Dan Klein reported that the Call for Papers had been posted to various groups, and that he hoped to have Jim Tamayko as keynote to talk about computers and space-craft. He thinks the conferences are losing some of the fun and suggested, among other things, having a computer game contest.

Quartermann suggested that the informal and technical program chairs coordinate between each other and report to the Board

liaison. Sonya Neufer was invited to be the informal programming chair for D.C. He also mentioned that a committee had been formed to organize parallel sessions at the conferences.

Professional Development Seminars Proposal

Donnelly proposed that the Association fund two "trial" seminars in 1989. The initial format would be a one day session of three tutorials. There was discussion about speaker compensation, the format, and registration fees. The Board agreed to allocate \$40,000 to be made available for the two seminars.

Speaker's Bureau

Donnelly stated that the purpose of a Speaker's Bureau would be to provide a source of speakers for educational groups who could discuss a variety of UNIX-related topics in a colloquium-type setting. It would be primarily an educational endeavor initially directed at universities, high schools, and local users groups. There was discussion regarding audiences, topics, and speakers. It was agreed to allocate \$6,000 to fund a Speaker's Bureau.

Sybase Report

Mark Seiden stated that the overall problem is that the Association is running several databases which he has been consolidating. While Sybase has not yet been used in the office, he had finished the user interface and hoped to have it up and running soon.

Legal

There was a discussion with our attorney, Dan Appelman, about our exposure under Maryland law with regard to a person not affiliated with USENIX selling books at a conference and not paying sales tax. Appelman stated that we are not liable for sales tax as long as it is clear that we are not associated with that person.

Young and Appelman discussed their meeting with the Vice Chancellor of the University of Capetown (UCT) regarding their wanting a UUNET/USENIX connection. Appelman stated that the export regulation laws aren't clear regarding UCT's status under the 1986 Comprehensive Anti-Apartheid Act. Appelman felt that the Board would not have much liability if the connection were open, but that a more secure route is to wait until the regulations are changed. After discussion it was decided to do nothing at this time.

UUNET Report

Rick Adams stated that their biggest problem is not being able to grow fast enough to meet the demand. Adams was informed of the Association's desire to pay off the FIB loan and work out a direct schedule of payments with them. Adams requested an additional \$20,000 loan to add more processors. After discussion, it was agreed to lend UUNET \$90,000 at a variable interest rate, and that USENIX send approximately \$70,000 to FIB to pay off the loan, and the balance be sent to UUNET, and that this loan be secured by UUNET's Sequent machine.

Standards – WG15 Report

Dominic Dunlop had been invited to the last working group meeting as a "Category A" liaison to monitor the group activities on behalf of users of the UNIX operating systems in Europe and North America.

Next Board Meeting

Quartermann suggested having the next Board meeting in Vienna. Since many of the group were already going to attend the EUUG Conference, most felt that having a Board meeting concurrent with an EUUG meeting would enable the two groups to have a joint meeting/reception.

-EY

An Update on UNIX and C Standards Activities

Jeffrey S. Haemer, Report Editor

USENIX Standards Watchdog Committee, August 1989

ANSI X3J11 C Language

Doug Gwyn (gwyn@brl.mil) reports:

There's not much new on the X3J11 (ANSI C) front.

As of about a week ago [i.e., mid-May, 1989 - jsh], X3 had not yet finished the rebalotting caused by having to respond to a previously lost, public comment letter from Russell Hansberry. X3J11 discussed these comments with Hansberry at the Seattle meeting, voted on some resulting proposals, and, in summary, reaffirmed previous resolutions of and decisions about all his issues. In all, no changes were made to the December 1988 draft proposed standard and rationale documents. An official response was sent to Hansberry, who had 15 working days to respond to X3, after which X3 would again ballot on whether or not to send the proposed C standard to ANSI for ratification. Hansberry replied, requesting a full formal review process. Since this was previously approved, we expect the same outcome for the rebalot, but the people involved in the appeals process are not the same as the ones with technical expertise who drew up the standard, so anything could happen. Certainly there will, at least, be a substantial delay in obtaining final approval of the submitted standard as an ANSI standard.

ISO WG14 met concurrently in Seattle. A Danish proposal for an alternative to trigraphs was defeated by both X3J11 and WG14; although one might hope that we've heard the last about this, the delay on the ANSI side might permit more hassle from the Danes. WG14 also agreed to submit the same proposed standard as ANSI's for ISO approval, with the understanding that British concerns about excessive instances of "undefined" behavior would be addressed early in the X3J11 "interpretations" phase. Specifically, the British would like all such instances clearly

identified. X3J11 is working with them to prepare an "information bulletin," which would clarify the standard without forcing a revision of the proposed standard itself.

X3J11 work for the foreseeable future will concentrate on answering questions about the standard and providing rulings on interpretations.

No new instances of X3.159/1003.1 conflict have arisen, to my knowledge, since the "great 'environ' problem." There have been several varying interpretations of how vendors should define `_STDC_` (if at all) in an "extended" implementation of X3.159, such as most POSIX vendors will be doing for reasons of backward compatibility. X3J11 certainly intended all positive integral values of `_STDC_` to be reserved for strictly standard-conforming implementations of C; there is some disagreement whether non-positive values should be used by vendors to indicate "ANSI C except with extensions." Unfortunately there is no way to constrain non-conforming implementations via wording in the standard.

A proposal that X3J11 undertake standardization of C++ was rejected; although there was a consensus that C++ was ready for a standards effort to begin, it was not felt that C++ should be undertaken by X3J11 itself, for a variety of reasons.

Rex Jaeschke has formed a "Numerical C Extension Group," which has begun work on identifying extensions needed for C to fully serve the numerical computing community. This is not yet officially under X3 auspices, but it could become so.

The X3J11 meeting slated for September, 1989 in Salt Lake City was canceled due to the approval delay; the next scheduled meeting is in New York City on March 5-6, 1990.

IEEE 1003.5 Ada Language

Ted Baker (tbaker@ajpo.sei.cmu.edu) reports of the April 1989 meeting:

The Minneapolis meeting started off poorly. The chair, co-chair, and technical editor were absent, though each for good reasons. ("Co-chair" is POSIX for vice-chair.) Only one of the members present had received a copy of the latest draft (2.0). Many of the changes agreed upon at the last meeting (Fort Lauderdale) were not yet reflected in this draft. There was no agenda.

Despite these handicaps, the group made considerable progress. Steve Deller acted as chair, working up an agenda and holding the group fairly closely to it. (Indeed, Steve Deller has now become an official co-chair, but is still doing a good job.)

By the second day copies of Draft 2.0 had been made. This draft was reviewed completely, and several changes were approved. The hottest issue was how signals would be mapped to Ada task entries. Several semantic gaps in the P1003.1 C-language binding were discovered, and passed on to the P1003.1 working group.

Most major semantic issues were, at this point, resolved.

1. Each Ada program consists of a single POSIX process, or at least appears to be so through the POSIX/Ada interface.
2. POSIX signals are handled by Ada tasks via the same mechanism as hardware interrupts, as logical entry calls.
3. POSIX character and string types are distinct from the standard Ada character and string types.
4. The C-binding's "errno" values are translated into distinct Ada exceptions.
5. The Ada-binding need not follow the organizational and naming conventions of the C-binding, especially where they violate principles of data abstraction.

What remains is filling in a lot of details, including most of the text of the document, and making it stylistically consistent.

Group members volunteered to edit the agreed-upon changes into the draft document, while filling in missing text. This work was to have been completed before May 10-12, at which time a subset of the working group would meet in Bedford MA for a "writing party." Its goal would be to catch up and complete all missing portions of the draft, so that it could be submitted for mock ballot before the July P1003 meeting. There was some question whether this goal would be met. (The mock ballot date was missed, so it appears 1003.5 won't have an official Ada language binding that corresponds to 1003.1 by end-of-year 1989.)

There were also coordination meetings (BOFs) with the groups working on language-independent specifications (P1003.1) and threads (P1003.4). The Ada group seemed generally pleased with progress on the language-independent specification, and hopes that the draft Ada-binding will provide some guidance to that activity. The group is less pleased with the tendency of other groups (e.g. P1003.2 and P1003.4) to aggravate the problem of C-dependencies in their draft documents.

The Ada group is very interested in having the 1003.4 standard include multi-threaded processes, but is very concerned that any such standard be compatible with the semantics of Ada tasks. Some of the preliminary proposals coming out of the threads working group do not seem to be compatible with this goal.

IEEE 1003.8 Networking

Steve Head (smh@hpda.hp.com) reports on the April 1989 meeting:

Overview

P1003.8 is the IEEE POSIX networking standards committee, working on network standard interface definitions for POSIX. The committee is divided into several subcommittees, including transparent file access, remote procedure call, network IPC, and MAP. There were approximately 30 attendees at P1003.8. This is a report on the network IPC subcommittee, which is creating both a "sophisticated" interface and a "naive"

interface for interprocess communications. Because it is not yet known whether the group's work will all go into a single standard, the word "standard" should probably be "standard(s)."

At the April meeting, the group redefined the goals of the two interfaces, and adopted a top-down methodology to avoid factional deadlock. It went on to set initial milestones for the end-product standards, complete a first pass of functionality and objects of interest, and initiate discussion and cooperation with other organizations and committees working in related areas.

Detail

At this meeting, the main topics of discussion were:

1. Goals
2. Methodology
3. Milestones
4. Functionality and Objects
5. Relationships to Other Organizations, Standards, and Evolving Standards
6. Naming
7. Async Events
8. XTI versus sockets
9. e-mail distribution list
10. Future Agenda

Note: in this report, "XTI" refers to X/Open's Transport Interface, a networking interface definition for UNIX based primarily on AT&T's TLI (Transport Library Interface). "CNI" refers to the Chemical Abstracts Company Network Interface, an independently developed transport level interface which is designed run not only on UNIX but other operating systems as well. "Sockets" refers to the popular, 4.3-BSD-based networking interface.

1. Goals

Several new goals were added over the week to the list of existing goals that had been developed for the sophisticated interface at the previous meetings.

- timeliness of getting the standard to the industry
- usability – the standard must be fully usable, without dangling dependencies
- quality – not repeat the "mistakes" of predecessors (XTI, sockets, and CNI)
- compatibility – preserve user investment in existing interfaces (XTI, sockets, etc.)

In review, the two interfaces share the following goals:

- ability to provide client-server support
- virtual circuit- or datagram-level service
- accommodate POSIX to non-POSIX datacomm
- support for multiple protocol suites and multiple networks in one machine
- few "system calls" per logical operation, though the naive interface will probably be less efficient than the sophisticated interface

In addition, the sophisticated interface wants:

- protocol-independent access to protocol-specific features
- sophisticated (POSIX real-time) event management of protocol interface
- provision for support of [existing] protocol-specific features
- "clean" feature availability
- integration with POSIX I/O routines (`read()` / `write()`)
- easy extensibility to future protocols
- access to network management functions, such as statistics
- access to network debugging functions, such as tracing

In contrast, the naive interface will have:

- no access to protocol specific features
- no provision for sophisticated event management
- potential support for known, existing protocols, but will not support user access to all protocol features

- less coupling to the POSIX I/O routines

Many of the new goals are relevant to both and may be formally adopted as time permits, but the committee did not have time to discuss how many of the new goals were also goals for the naive interface.

This is an issue in its own right. Part of the reason for the lack of time is the need to divide attention between the two interfaces. This halves the time one would otherwise have for any given topic. The committee hopes to overcome this problem in time by merging the two interfaces into one or by dividing the committee into subgroups to work on the two interfaces in parallel. It is too early to decide which (if either) tack to take yet; neither interface is well enough defined.

2. Methodology

Someone suggested a top-down approach, for these advantages:

- form and order in the production of the standard
- avoidance of deadlocks, such as sockets versus XTI
- cleaner final design

Favorably disposed to the suggestion, the group informally adopted it.

3. Milestones

Several official milestones were set.

- | | |
|-----------------------------|------|
| • starting the draft | 1989 |
| • finishing the first draft | 1990 |
| • mock ballot | 1991 |
| • full ballot | 1992 |

Earlier dates are possible if more working members can be found to share the expected workload. (Readers, wake up: this is your chance to pitch in and help the committee make progress!)

4. Functionality and Objects

The group presented and discussed the functionality and objects for the "naive" and "sophisticated" standards. The lists generated were rough supersets of the functionality and objects in XTI, sockets, CNI, and UNI, and are available from Steve Head

(*smh@hpda.hp.com*) on request. (This has progressed to a skeleton outline Draft, as of the San Jose meeting.)

The discussions laid a framework for the next tasks before the group: to separate out specific "sophisticated" from "naive" features, and to group the functionality and objects in a quasi-language-independent way. Only after this is done will the group generate C bindings to the standard.

5. Relationships to Other Organizations

The Chair of P1003.8 made contact with the ISO committees on ISO protocols. Apparently the rumor that ISO would object to a transport-level interface on the basis that it is not entering the top of the ISO stack is unfounded. The chair found no objections among those he contacted on this issue.

Several parallel efforts at a transport standard were discussed:

- OSF
- UI
- X/Open XNET's XTI
- P1003.4 (real-time) Messages

Steve Head, acting chair of the OSF SIG on Base Communication Services / Transport Interfaces Subgroup, sketched OSF status in this area. Petr Janocek, X/Open XNET chair, described XNET status, and Kathy Bohrer, leader of the P1003.4 messages working group, gave an overview of its effort.

Holes in each of these efforts currently prevent the adoption of any of them as a standard by the group. 1003.8/IPC will address major networking-specific interface issues left unresolved by other groups, and will continue to work on an interprocess communication standard that is usable, protocol-independent, and well-integrated with the rest of POSIX.

P1003.4 (real-time) messages were especially controversial. It came as a surprise to many group members (and, frankly, many other POSIX members) that 1003.4's charter includes "system extensions." There seems to be a general feeling that "real-time" is a misleading name, and 1003.4 may not receive adequate coverage in the balloting procedure.

The group felt that this could be a real problem for extensions that are intended to solve problems involving multiple nodes in a network. For example, though the message interface is primarily for real time and generic, messaging-application needs on a single node, it can also include operation over networks that share file systems, and enable rendezvousing using the 1003.1 file system (assuming messages are supported by POSIX Transparent File Access – which is not at all clear at this time). A file system name space is generally inadequate for general network rendezvous purposes, requiring, as it does, mounts for every possible node, special files or clone files for every possible endpoint, potentially performance- and reliability-impacting extensions to the internal file name resolution routine (e.g., `namei()` or its equivalent), the adoption of new, complex protocols to handle requests, and other considerations.

The committee also worried that several aspects of the 1003.4 messaging interface seemed redundant or inefficient.

The 1003.4 messages subgroup scheduled a joint meeting with 1003.8 in July to discuss these problems. In addition, all actively attending 1003.8 working group members were to be placed on the balloting list for the May real-time mock ballot.

6. Naming

P1003.8 is forming a “naming” subgroup which will meet in July.

This group isn’t likely to solve the name resolution problem from scratch (lack of time, not inspiration) so they may continue to address it until the naming subcommittee takes over. The subgroup may decide to meet with them jointly and include them on its balloting rather than give them a problem they can’t ramp up to in time for a solution. Incidentally there are many name resolution issues, not just a single problem or single interface likely to solve all problems.

7. Asynchronous Events

John Barr, the leader of the asynchronous events subgroup, presented their model of asynchronous event handling to the group. This was mostly a formality; group members

had already been exposed to POSIX real-time async events handling.

Some concern was raised about `select()`. Members pointed out that the real-time draft for async events implied more syscall overhead than occurs in `select()` in BSD or `poll()` in V.3; the real-time group will resolve the issue, in possible conjunction with the supercomputing group, which gave us an interesting presentation the `listio()` routine, which can be used to fire off multiple I/O transfers operating on a list of file descriptors.

8. XTI versus sockets

The “XTI versus sockets” issue is so important to users and vendors that it couldn’t be left unaddressed. Here is the official committee consensus:

We make no decision at this time on the sophisticated interface’s actual relationship to the existing socket and XTI interfaces, but it will have a flavor and functionality and granularity similar to that provided by the socket and XTI interfaces.

In other words, the group feels that there are advantages to both XTI and sockets, and that POSIX will adopt features from both, but has not yet addressed whether there will be a straightforward adoption or direct extension of either, or will take some new form. (One hopes that a new form would be a functional superset of the other two.)

The group is quite aware that there are several camps and many potentially conflicting goals in this highly sensitive area. Getting XTI and socket advocates to agree on a common interface will probably be a monumental task, fraught with potential dangers and traps. Any new interface would be likely to need a clear migration path from XTI and/or sockets to minimize code changes needed for existing applications: for example, sets of macro routines or public domain layer routines published in appendices. The group is aware of the possible precedent set by POSIX 1003.1 with regard to System V and 4.2 BSD (the `termios` section in particular). The group will study the potential benefits and drawbacks of all identifiable options before making any decisions.

The adage that "everyone wants things to get better, but no one wants anything to change" applies here. The sophisticated interface will require some compromises. The various camps must realize the benefits of joining forces and agreeing on a common standard if the working group is to be successful in this endeavor.

9. E-mail distribution list

The group will use e-mail distribution lists to expedite work and communication between meetings. The U.C. Berkeley representatives volunteered to organize this effort and maintain the lists on their machines.

Anybody may join the list by mailing to posix-net-ptp-request@ucbvax.berkeley.edu.

10. Future Agenda

At the San Jose meeting, P1003.8/IPC will:

- separate the functionality and objects list into ones for the "naive" and "sophisticated" interfaces;
- obtain (from action items between meetings) a more detailed list of objects, and a first cut at grouping the functionality and objects into functions for the two interfaces, and continue work from that point;
- continue to work with P1003.4 on the issues of message interface and async events.

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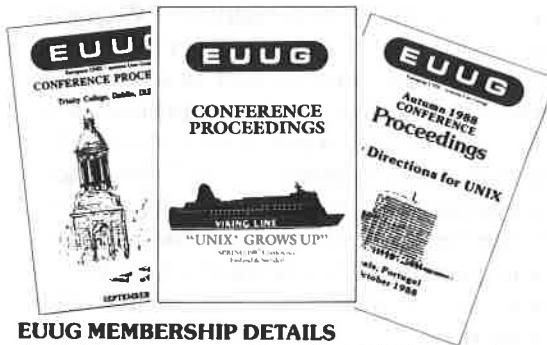
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[†] Tom Ferrin of the University of California at San Francisco, a former member of the Board of Directors of the USENIX Association, has overseen the production of the 4.2 and 4.3BSD manuals.

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The Association will support local user groups by doing a mailing to assist the formation of a new group and publishing information on local groups in ;login:. At least one member of the group must be a current member of the Association. Send additions and corrections to login@usenix.org.

CA - Fresno: the Central California UNIX Users Group consists of a *uucp*-based electronic mailing list to which members may post questions or information. For connection information:

Educational and governmental institutions:
 Brent Auernheimer (209) 294-4373
brent@CSUFresno.edu or csufres!brent

Commercial institutions or individuals:
 Gordon Crumal (209) 875-8755
csufres!gordon (209) 298-8393

CO - Boulder: the Front Range UNIX Users Group meets monthly at different sites.

Steve Gaede (303) 938-2985
 NBI, Inc.
 P.O. Box 9001
 Boulder, CO 80301
[\(boulder,hao\)!nbires!gaede](mailto:(boulder,hao)!nbires!gaede)

FL - Coral Springs:

S. Shaw McQuinn (305) 344-8686
 8557 W. Sample Road
 Coral Springs, FL 33065

FL - Fort Lauderdale/Miami: The South Florida UNIX Users Group meets the 2nd Tuesday of each month.

Tony Vincent, John McLaughlin <i>{sun,novavax,gould}!sunvice!tony</i> jmcLaughlin@sUN.COM	(305) 776-7770
John O'Brien <i>gatech!uflorida!novavax!john</i>	(305) 475-7633
Don Joslyn <i>gatech!uflorida!novavax!rm1!don</i>	(305) 476-6415

FL - Jacksonville/Northeast: UNIX Users of Jacksonville (uujax) meets the 2nd Thursday of each month.

Tom Blakely <i>uflorida!unf7!tfb</i>	(904) 646-2820
Emilie Olsen	(904) 390-3621

FL - Melbourne: the Space Coast UNIX Users Group meets at 8pm on the 3rd Wednesday of each month at the Florida Institute of Technology.

Bill Davis (407) 242-4449
bill@ccd.harris.com

FL - Orlando: the Central Florida UNIX Users Group meets the 3rd Thursday of each month.

Mike Geldner <i>cudas!sunfla!mike</i>	(305) 862-0949
Ben Goldfarb <i>goldfarb@hcx9.ucf.edu</i>	(305) 275-2790
Mikel Manitius <i>{codas,attmail}!mikel</i>	(305) 869-2462

FL - Tampa Bay: the Tampa UNIX Users Group meets the 1st Thursday of each month in Largo.

Bill Hargen <i>uunet!pdn!hargen</i>	(813) 530-8655
George W. Leach <i>uunet!pdn!reggie</i>	(813) 530-2376

GA - Atlanta: meets on the 1st Monday of each month in White Hall, Emory University.

Atlanta UNIX Users Group P.O. Box 12241 Atlanta, GA 30355-2241	
Marc Merlin Mark Landry	(404) 442-4772 (404) 365-8108

MI - Detroit/Ann Arbor: The SouthEastern Michigan Sun Local Users Group meets jointly with the Nameless UNIX Group on the 2nd Thursday of each month in Ann Arbor.

Steve Simmons <i>scs@lokkur.dexter.mi.us</i>	home: (313) 426-8981 office: (313) 769-4086
---	--

K. Richard McGill <i>rich@sendai.ann-arbor.mi.us</i>	
Bill Bulley <i>web@applga.uucp</i>	

MI - Detroit/Ann Arbor: dinner meetings the 1st Wednesday of each month.

Linda Mason <i>michigan!usr/group</i> P.O. Box 189602 Farmington Hills, MI 48018-9602	(313) 855-4220
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:login: 14:5

MN - Minneapolis/St. Paul: meets the 1st Wednesday of each month.

UNIX Users of Minnesota
17130 Jordan Court
Lakeville, MN 55044

Robert A. Monio (612) 895-7007
pnessutt@nis.mn.org

MO - St. Louis:

St. Louis UNIX Users Group
Plus Five Computer Services
765 Westwood, 10A
Clayton, MO 63105

Eric Kiebler (314) 725-9492
plus5!sluug

NE - Omaha: meets the 2nd Thursday of each month.

/usr/group nebraska
P.O. Box 44112
Omaha, NE 68144
Kent Landfield (402) 291-8300
kent@ugn.uucp

New England - Northern: meets monthly at different sites.

Peter Schmitt (603) 646-2999
Kiewit Computation Center
Dartmouth College
Hanover, NH 03755
decvax!dartvax!nneuug-contact

NJ - Princeton: the Princeton UNIX Users Group meets monthly.

Pat Parseghian (609) 452-6261
Dept. of Computer Science
Princeton University
Princeton, NJ 08544
pep@Princeton.EDU

NY - New York City:

Unigroup of New York
G.P.O. Box 1931
New York, NY 10116
Ed Taylor (212) 513-7777
{attunix,philabs}!pencom!taylor

New Zealand:

New Zealand UNIX Systems User Group
P.O. Box 13056
University of Waikato
Hamilton, New Zealand

OK - Tulsa:

Pete Rourke
\$USR
7340 East 25th Place
Tulsa, OK 74129

PA - Philadelphia: the UNIX SIG of the Philadelphia Area Computer Society (PACS) meets the morning of the 3rd Saturday of each month.

G. Baun, UNIX SIG
c/o PACS
Box 312
La Salle University
Philadelphia, PA 19141
rutgers!{bpa,cbmvax}!
temvax!pacssb!{gbaun,whutchi}

TX - Dallas/Fort Worth:

Dallas/Fort Worth UNIX Users Group
Seny Systems, Inc.
5327 N. Central, #320
Dallas, TX 75205
Jim Hummel (214) 522-2324

TX - Houston: the Houston UNIX Users Group (Hounix) meets the 3rd Tuesday of each month.

Hounix answering machine (713) 684-6590
Bob Marcum, president (713) 270-8124
Chuck Bentley, vice-president (713) 789-8928
chuckb@hounix.uucp

TX - San Antonio: the San Antonio UNIX Users (SATUU) meets the 3rd Thursday of each month.

Jeff Mason (512) 494-9336
Hewlett Packard
14100 San Pedro
San Antonio, TX 78232
gatech!petro!hpsatb!jeff

WA - Seattle: meets monthly.

Bill Campbell (206) 232-4164
Seattle UNIX Group Membership Information
6641 East Mercer Way
Mercer Island, WA 98040
uw-beaver!tikal!camco!bill

Washington, D.C.: meets the 1st Tuesday of each month.

Washington Area UNIX Users Group
2070 Chain Bridge Road, Suite 333
Vienna, VA 22180
Samuel Samalin (703) 448-1908

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